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SPRING MIGRATION IN THE CRAYFISH, *CAMBARUS ARGIL-  
LICOLA FAXON*

BY

HAROLD CUMMINS  
Tulane University

Incidental to a study of the migration of frogs into their breeding ponds, carried out near Ann Arbor, Michigan, in the spring of 1914, some interesting observations were made upon migratory activities of this burrowing crayfish. So little is published regarding the habits of crayfishes that even these few notes seem to be worthy of publication.

The location and character of the pond and the method of obtaining migration data by trapping are described in another paper.<sup>1</sup> Briefly it may be said that the pond is at the edge of a cultivated field, bounded partially by a wood which adjoins the field. About this pond a trap was constructed, extending approximately two-thirds of its circumference. The trap consisted of a cloth fence, provided with leaders of similar construction extending radially outward from the main fence. At the junction of each leader and the main fence a pail half-filled with water was sunk in the earth with its top at ground level. Crayfishes migrating toward the pond came in contact with this cloth barrier, and as they edged along it in an attempt to enter the pond were entrapped in the pails. Since the pond was not completely enclosed by the trap the number of crayfishes taken does not necessarily represent the total number of migrants; some may have gained entrance where the fence was incomplete.

White's Wood, at the edge of which the pond is located, fulfills the habitat requirements of this species, and so far as the writer's collections indicate, *C. argillicola* is the only crayfish that occurs there. In addition to the observation pond there are four small ponds in the wood, two of which like the observation pond are usually not dried in the summer. The remaining two always dry during the summer. All of them are frequented by crayfishes. The burrows, usually with chimneys, form a characteristic feature of the habitat; sometimes they are found at some distance from the ponds, but usually near them, and when the ponds dry numbers of chimneys are thrown up on the exposed mud.

After their winter torpidity was dissipated by warm weather, crayfishes reappeared in the pond, not only from the bottom of the pond itself but also from outside sources. The first individuals to appear were those which had spent the winter in burrows in the pond bottom. On March 23 the burrows were first opened to the surface, numbers of them being

<sup>1</sup> Cummins, Harold, The rôle of voice and coloration in spring migration and sex recognition in frogs. Jour. Exp. Zool., v. 30, no. 3, April 1920.

[illegible]

It is evident from the chart that migration occurs at irregular intervals. There is a broken migration wave from March 26 to April 2, inclusive, and an unbroken wave from April 26 to 30, inclusive, while in the period from April 3 through April 25 but one crayfish was trapped. The migration waves occurred during periods of relatively high temperature and humidity. The lowest temperature with which a migration is coincident is 33.6 degrees (April 21), but with only one individual. A temperature more favorable to migration, if judgment can be based on the trap catch, is 42 degrees or over. All the catches are coincident with high humidities, the lowest being 87 (March 29), the others ranging between 90 and 100.

With the exception of the female carrying young, captured on April 21, all the collections were made in the morning, representing crayfishes

migrating during the preceding night. The single exception is noteworthy in demonstrating that spring migratory activity may occur in the daytime. This migrant was not actually trapped, but was noted at 10 A. M. walking in the grass near the edge of the pond. In view of the remaining migrations having been nocturnal, probably this record represents a crayfish which migrated during the preceding night, and, coming in contact with the fence, walked away instead of alongside as did others.

The small number of immature individuals is suggestive. One trapped April 30 was only an inch in length, and therefore unquestionably not sexually mature. The remaining six were about two-thirds the size of average adults. Whether there is some stimulus controlling the migration of adults, which is usually lacking in the young, or whether the young will migrate later are questions which cannot be answered with the data at hand. The facts of an early beginning of migration among adults and the retardation of migration of all but one of the immature crayfishes leads to the inference that migratory impulses occur both in young and adults, but begin to function earlier in the season in the latter.

A total of ten plus "several" females with eggs were captured on March 29 and April 2, and none appeared thereafter. During the first migration wave several females without eggs (two plus two lots of "several" each) were trapped, and in the second wave five without eggs appeared. Three females carrying young appeared in the second wave. The bearing of these data upon the time and place of egg-laying and hatching is important, but difficult of interpretation. If those females bearing eggs and young furnish a standard of comparison, we must assume either that there is a prolonged period for the egg-laying and hatching of the last five females or that their eggs already had hatched. The same question does not arise in connection with the females without eggs which were captured early. It seems that a migratory movement of adult females in the spring would prove advantageous to the young, for they would hatch in water which presumably provides a more favorable environment for them than the burrows.